

Community Exposure to Perfluorooctanoate: Sources of Exposure and Health Effects

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Perfluorooctanoate (PFOA) is persistent in humans and the environment and is ubiquitous at low levels in human serum. The source(s) of general population exposure have been unknown. No studies of PFOA effects on the health of the general population have been reported. Residents of the Little Hocking water district in Southeastern Ohio have potential water and air exposure from nearby fluoropolymer production. We formed an environmental justice partnership to perform a study of the sources and effects of PFOA in this community. We measured serum PFOA and administered questionnaires to a stratified random sample of 324 subjects from 161 households, plus 54 individuals from 35 volunteer households selected by lottery. PFOA in residents of the Little Hocking water district measured by high performance liquid chromatography (HPLC)/tandem mass spectroscopy, and confirmed using C13 labeled standards, greatly exceeded published US general population medians of ~5ng/mL. Control individuals from Philadelphia had values in the normal population range. Occupational exposure from production processes using PFOA and residential water had additive effects; no other occupations contributed. The major non-occupational source in this community was from water ingestion.

Median serum PFOA for residents with both air and water exposure was 326ng/mL and was 367ng/mL outside the air plume, but with the same water supply, indicating negligible air exposure contribution. Median PFOA was 55ng/mL for current consumers of bottled/spring/cistern water. In well water users, serum PFOA reflected well water PFOA. The median serum/water PFOA ratio for Little Hocking water users was 105. Serum PFOA was significantly higher in children aged <6 years and those aged >60. No gender differences were observed. For residents whose sole water source was Little Hocking water, we used the General Estimating Equation to assess the contribution of other variables: the model of best-fit included age, tap water drinks per day, servings per week of homegrown fruit and vegetables, and carbon filter use. Eating locally harvested meat and game was not significant. The association with eating homegrown fruits and vegetables may reflect water use in cooking, cleaning, and canning. As a result of the findings of high serum PFOA, bottled water has been made available to residents in the community. Studies of both exposure and human health effect variables are continuing.

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